The Exascale Computing Project awards $34 million for software development

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OAK RIDGE, Tenn., Nov. 10, 2016 – The Department of Energy's Exascale Computing Project (ECP) today announced the selection of 35 software development proposals representing 25 research and academic organizations.

The awards for the first year of funding total $34 million and cover many components of the software stack for exascale systems, including programming models and runtime libraries, mathematical libraries and frameworks, tools, lower-level system software, data management and I/O, as well as in situ visualization and data analysis.

Exascale refers to computing systems at least 50 times faster than the nation's most powerful supercomputers in use today.

According to Paul Messina, director of the ECP, "These software development awards are a major first step toward developing a comprehensive and coherent software stack that will enable application developers to productively write highly parallel applications that can portably target diverse exascale architectures." Messina continued, "After a lengthy review, we are pleased to announce that we have selected 35 proposals for funding. The funding of these software development projects, following our recent announcement for application development awards, signals the momentum and direction of ECP as we bring together the necessary ecosystem and infrastructure to drive the nation's exascale imperative."

The full list of selected proposals receiving funding, principal investigators, and collaborating organizations are as follows:

• xGA: Global Arrays on Extreme Scale Architectures, Abhinav Vishnu, Pacific Northwest National Laboratory (PNNL)
• Integrated Software Components for Managing Computation and Memory Interplay at Exascale, Richard Hornung, Lawrence Livermore National Laboratory (LLNL)
• Lightweight Communication and Global Address Space Support for Exascale Applications, Scott Baden, Lawrence Berkeley National Laboratory (LBNL)
• Exascale MPI, Pavan Balaji, Argonne National Laboratory (ANL)
• Enhancing and Hardening the Legion Programming System for the Exascale Computing Project, Galen Shipman, Los Alamos National Laboratory (LANL) with ANL, Stanford Univ.
• Distributed Tasking for Exascale, Jack Dongarra, Univ. of Tenn.
• ECP Applications effective use of Kokkos to achieve performance portability across exascale architectures, Carter Edwards, Sandia National Laboratories (SNL) with LANL, Oak Ridge National Laboratory (ORNL)

• Open MPI for Exascale (OMPI-X), David Bernholdt, ORNL with LANL, LLNL, SNL, Univ. of Tenn.

• A Runtime System for Application-Level Power Steering on Exascale Systems, Martin Schulz, LLNL with Univ. of Arizona

• SOLLVE: Scaling OpenMP with LLVM for Exascale performance and portability, Barbara Chapman, Brookhaven National Laboratory (BNL) with ANL, LLNL, ORNL, Rice Univ., UIUC

• PROTEAS: PROgramming Toolchain for Emerging Architectures and Systems, Jeffrey Vetter, ORNL with ANL, LANL, Univ. of Oregon

• Extending HPCToolkit to Measure and Analyze Code Performance on Exascale Platforms, John Mellor-Crummey, Rice Univ. with Univ. of Wisconsin

• Autotuning Compiler Technology for Cross-Architecture Transformation and Code Generation, Mary Hall, Univ. of Utah with ANL, LBNL

• EXA-PAPI: The Exascale Performance Application Programming Interface, Jack Dongarra, Univ. of Tenn.

• Exascale Code Generation Toolkit, Dan Quinlan, LLNL with PNNL, Ohio State Univ., Colorado State Univ.

• Software for Linear Algebra Targeting at Exascale (SLATE), Jack Dongarra, Univ. of Tenn.

• Production-ready, Exascale-Enabled, Krylov Solvers (PEEKS) for Exascale Computing, Mike Heroux, SNL with Univ. of Tenn.

• ForTrilinos: Sustainable Production Fortran Interoperability with Trilinos Libraries, Mike Heroux, SNL with LANL, ORNL

• Factorization Based Sparse Solvers and Preconditioners for Exascale, Sherry Li, LBNL

• Extreme-scale Scientific Software Development Kit for the Exascale Computing Project: xSDK4ECP, Lois Curfman McInnes, ANL with LBNL, LLNL, SNL, Univ. of Tenn, UC Berkeley

• ALExa: Accelerated Libraries for Exascale, Wayne Joubert, ORNL

• Enabling Time Integrators for Exascale Through SUNDIALS, Carol Woodward, LLNL with Southern Methodist Univ.

• Preparing PETSc/TAO for Exascale, Barry Smith, ANL with Univ. of Colorado, Rice Univ.

• VeloC: Very Low Overhead transparent multilevel Checkpoint/restart, Franck Cappello, ANL with LLNL

• EZ: Fast, effective, parallel error-bounded exascale lossy compression for scientific data, Franck Cappello, ANL

• UNIFYCR: A Checkpoint/Restart File System for Distributed Burst Buffers, Kathryn Mohror, LLNL with ORNL

• ExaHDF5: Delivering Efficient Parallel I/O on Exascale Computing Systems, Suren Byna, LBNL with ANL, The HDF Group

• The ADIOS framework for Scientific Data on exascale systems, Scott Klasky, ORNL with LBNL, Kitware, Rutgers Univ.

• Data Libraries and Services Enabling Exascale Science, Rob Ross, ANL with LANL, Northwestern Univ.

• ZFP: Compressed Floating-Point Arrays, Peter Lindstrom, LLNL

• ECP ALPINE: Algorithms and Infrastructure for In Situ Visualization and Analysis, James Ahrens, LANL with LBNL, LLNL, Univ. of Oregon, Kitware

• ECP VTK-m: Updating HPC Visualization Software for Exascale-Era Processors, Ken Moreland, SNL with LANL, ORNL, Univ. of Oregon, Kitware

• Enhancing Qthreads for ECP Science and Energy Impact, Ron Brightwell, SNL
• A Simplified Complex Memory API and Operating System/Runtime Interface for ECP, Mike Lang, LANL with LLNL, ORNL, SNL, Georgia Tech
• Argo: Operating system and Resource Management for Exascale, Pete Beckman, ANL with LLNL

About ECP

The ECP is a collaborative effort of two DOE organizations—the Office of Science and the National Nuclear Security Administration. As part of President Obama's National Strategic Computing initiative, ECP was established to develop a capable exascale ecosystem, encompassing applications, system software, hardware technologies and architectures, and workforce development to meet the scientific and national security mission needs of DOE in the early-2020s time frame.

About the Office of Science

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